



Operating Instructions

JWrada-21/22 Radar Level Meter

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1 Product Introduction

1.1 Overview

The JWrada-2X Radar Level Sensor is a compact, low-cost radar level instrument based on 80 GHz Frequency Modulated Continuous Wave (FMCW) technology. It provides level measurement with a maximum range of up to 30 meters, and is also suitable for short-range and simple process conditions.

The JWrada-2X is equipped with HART/Modbus communication protocols and an integrated Bluetooth 5.0 module. In combination with the JW Tools APP and WeChat applet, it enables on-site wireless commissioning and monitoring, greatly simplifying field operation. Through the cloud data network, it also supports remote commissioning, remote software upgrades, and remote monitoring. With the self-developed echo-learning adaptive algorithm, the device is capable of self-learning false echo recognition, multi-echo separation, and dynamic target tracking. This ensures automatic adaptation to changing process conditions, precise measurement, and long-term stable and reliable operation. The product features easy operation and is maintenance-free.

The JWrada-2X Radar Level Sensor is an ideal replacement for ultrasonic level transmitters, and is widely used in hydrology and water services level monitoring, simple process level measurement, and short-range bulk solid level measurement.

The JWrada-2X model comes with a built-in simple display, making on-site installation and commissioning more convenient.

1.2 Working Principle

The Radar Level Sensor emits high-frequency electromagnetic waves through its antenna. When the signal encounters the surface of the measured material, it is reflected back and received by the antenna. The device calculates the distance between the radar antenna and the material surface by measuring the travel time of the electromagnetic wave (Time Domain Reflectometry, TDR) or by analyzing the center frequency shift of the intermediate frequency signal (Frequency Modulated Continuous Wave, FMCW), in combination with the speed of light. This allows for accurate determination of the material level.

This measurement method is non-contact, suitable for a wide range of media including liquids, granules, and powders. It offers strong interference resistance and is unaffected by changes in temperature, pressure, or vapor, providing high adaptability and reliable performance.

1.3 Benefits

- Compact and cost-effective design
- Equipped with a simple display for convenient on-site installation and commissioning
- High-accuracy measurement (± 1 mm) with a maximum liquid level range of 30 meters; also suitable for short-range and simple-condition bulk solid level measurement

Radar Sensor

- Built-in Bluetooth 5.0 module, compatible with the “JW Tools” APP for wireless on-site configuration and monitoring; cloud connectivity enables remote commissioning, software upgrades, and monitoring
- Intelligent echo processing with self-learning capabilities, including false echo suppression, multi-echo separation, and dynamic target tracking, ensuring consistently high-quality, accurate measurement
- Housing made of lightweight, UV-resistant nylon plastic
- An ideal replacement for ultrasonic level meters, particularly suitable for hydrology and water management applications

1.4 Applications

- River and open channel water level measurement
- Sewage and wastewater treatment
- Reservoir and sluice gate monitoring
- Urban flooding and drainage system early warning
- General industrial liquid level measurement under simple conditions and short-range bulk solid level measurement

2 Technical specification

Features	Compact, simple, cost-effective 80GHz high-frequency radar level sensor with display	
Application	Especially suitable for hydrology and water management, simple liquid level measurement, and short-range bulk solid level measurement	
Measurement Parameter	Frequency	80GHz
	Measuring Range	30m
	Beam Angle	6°-13°
	Accuracy	±1mm
Material	Integrated housing and antenna lens	Nylon plastic/316L, with optional metal material available upon request
Installation	G3/4 and G1 1/2 thread with fastening nut	Direct threaded installation, or bracket through-hole (φ48 mm ±1) installation with fastening nut
Power Supply	Two-wire	12 ~ 30V DC
	Four-wire	
Signal Output	Two-wire	4 ~ 20mA/HART
	Four-wire	RS485/Modbus
	Bluetooth	Support Bluetooth® v5.4
Operating Environment	Process Pressure	-1 ~ 3 bar
	Process Temperature	-40°C ~ 80°C
	Ambient Temperature	-40°C ~ 80°C
	Storage Temperature	-40°C ~ 80°C
Safety Certification	Ingress Protection	IP66/IP68 (0.2 bar)
Cable	Cable Entry	L16 connector

3Dimensional drawings

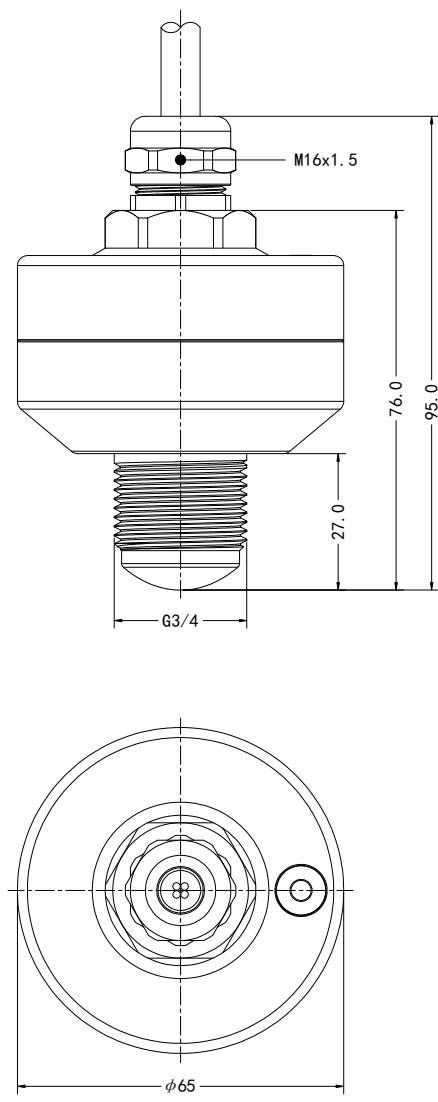


Fig.1 JWrada-20 Radar Sensor

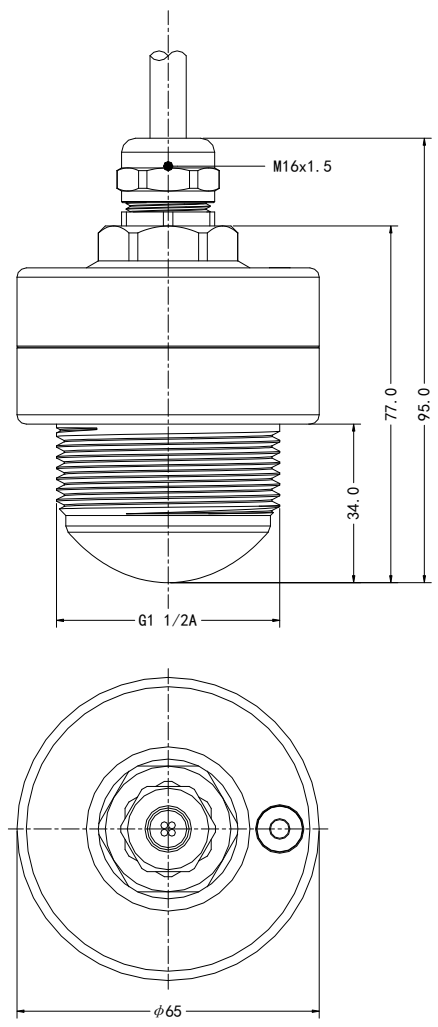


Fig.2 JWrada-20 Radar Sensor

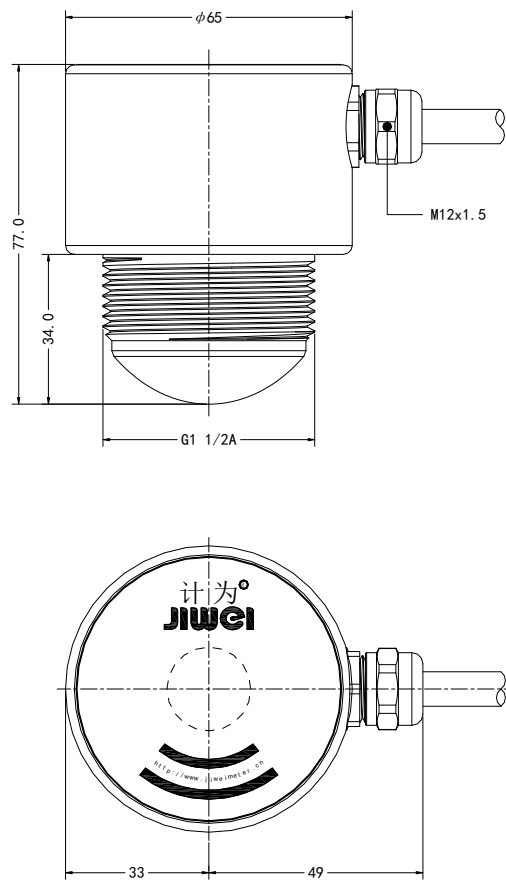


Fig. 3 JWrada-22 Radar Sensor

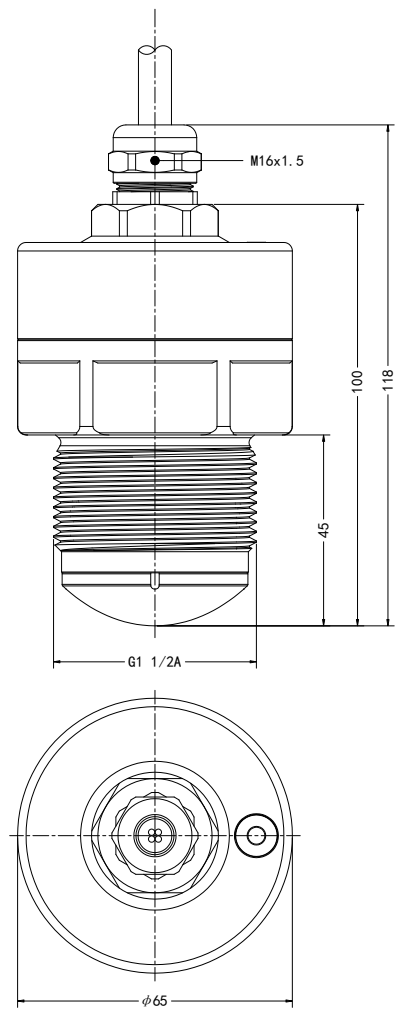


Fig. 4 JWrada-22 Radar Sensor

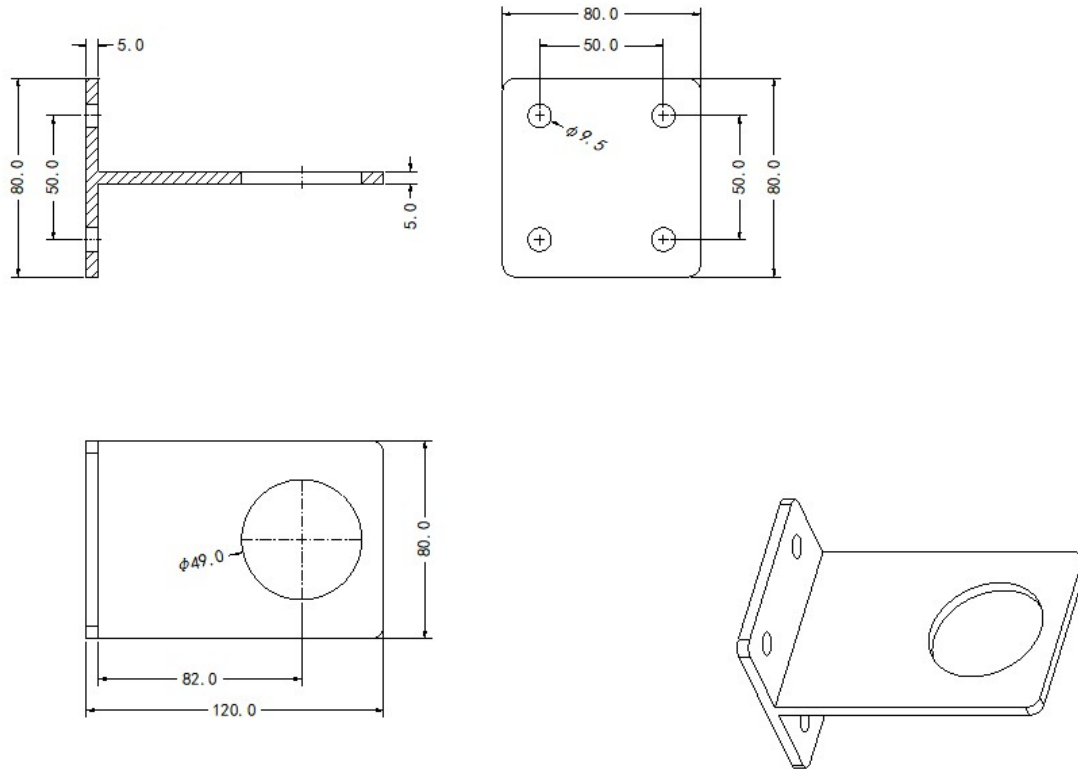


Fig. 5 Schematic Diagram of T-Type Bracket

4 Installation Requirements

4.1 Pre-Installation Instructions

1) Measurement Area: The radar level transmitter emits electromagnetic waves with millimeter-level wavelength as the measurement signal. When the radar signal reaches the surface of the measured object, it forms a defined measurement area. This radar measurement area can be approximately represented as a circle, whose radius is proportional to the measurement distance. The radius of this circle is determined by both the distance from the radar antenna to the measured object and the beam angle of the radar antenna. Within the planar range on the surface of the measured object, the radar signal energy density is the highest.

Measurement Distance (m)	Beam Angle	Measurement Area Radius (m)
2	6°	0.1
5	6°	0.25
10	6°	0.5
20	6°	1.0
30	6°	1.5

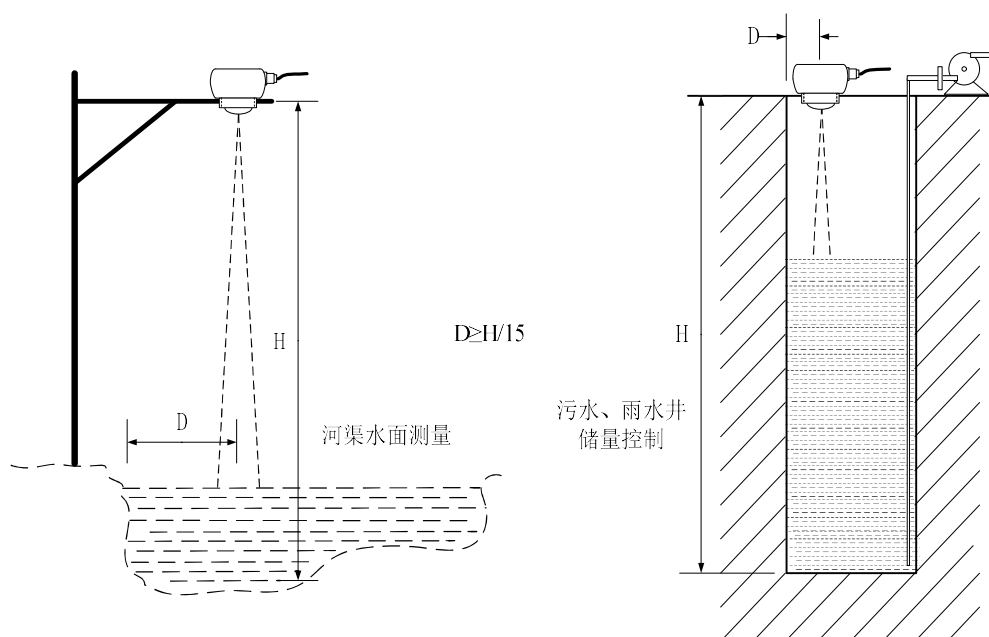
2) Radar Signal Radiation Area: The radar signal radiation area is defined as a conical space with the center of the radar antenna lens as the apex and the measurement area as the base.

Within this conical space, the radar signal energy density is highest.

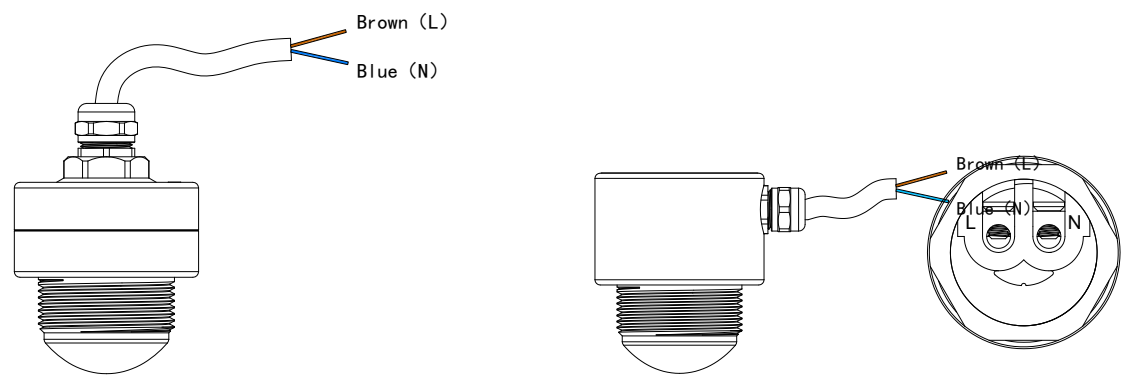
- 3) Reference Plane: The starting point of the radar level measurement is taken from the contact surface between the instrument and the tank. This position serves as the reference plane for the radar level measurement.

4.2 Installation Precautions

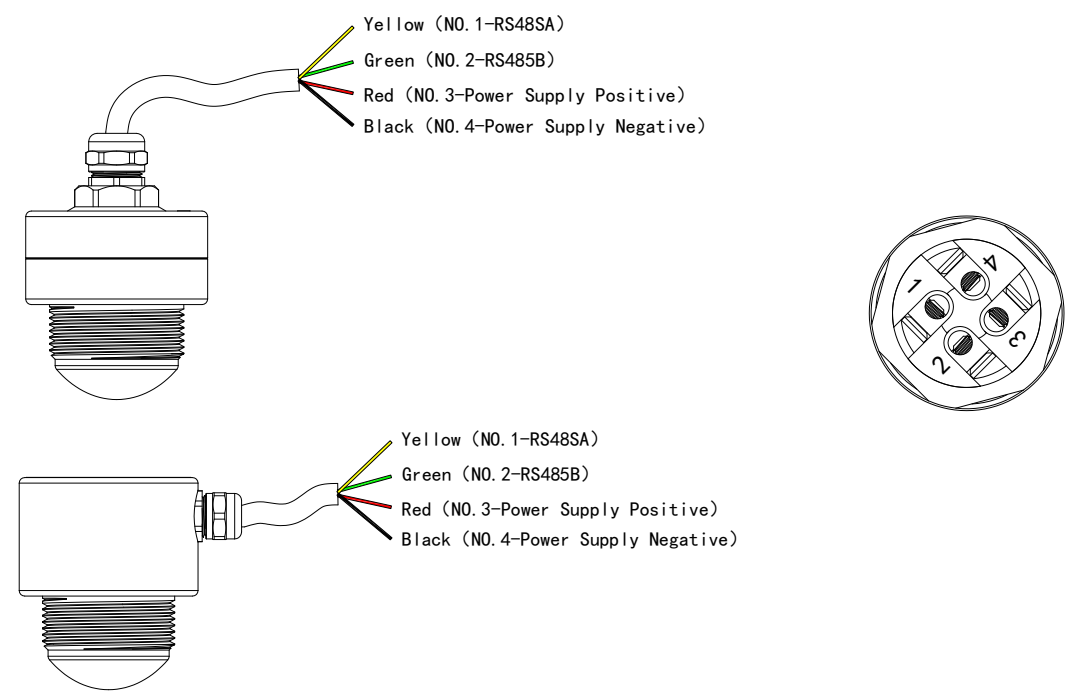
- 1) Vertical Installation: Ensure that the radar level transmitter is installed perpendicular to the liquid surface. Any tilt may weaken the radar signal and affect measurement accuracy.
- 2) Distance from Side Walls: The radar level transmitter should be installed at least 20 cm away from the side walls to avoid interference. Generally, maintain a distance of at least $1/20$ of the measurement range from the tank wall, but not less than 20 cm. For example, for a 10 m high tank, the safe measurement distance is 0.5 m. For underground pipelines, try to install the transmitter near the center of the well.
- 3) No Obstructions in the Measurement Area: Ensure that the radar measurement area is free from any obstructions such as ladders, limit switches, or other objects.
- 4) Outdoor or Humid Environment Precautions: When the level transmitter is installed outdoors or in a humid environment, rainwater or condensation may flow down along the device. Before connecting the cables, bend the cables downward to prevent water or moisture from entering the instrument.



4 Dimensional drawings



Two-wire



Four-wire

Wiring Instructions

Two-wire (JWrada-21T, JWrada-22T)		
No.	Wire Color	Description
L	Red	Positive Power
N	Black	Negative Power

Four-wire (JWrada-21F, JWrada-22F)		
No.	Wire Color	Description
1	Yellow	RS485-A
2	Green	RS485-B
3	Red	Positive Power
4	Black	Negative Power

5 Parameter Setting Instructions

5.1 【Material Display】

Set the real-time value displayed on the main interface.

No.	Parameter	Description
1	Distance	
2	Material Height	Material Height = Low Level – Distance
3	Percentage	Percentage = Material Height ÷ (Low Level – High Level)

5.2 【Material Type】

The instrument features **adaptive algorithms** for both solid and liquid applications. Customers can configure the response according to the measured material on site.

No.	Parameter
1	Liquid
2	Solid

5.3 【Material State】

Set the state property of the liquid or solid material.

No.	Parameter
1	Normal
2	Volatile
3	Crystalline
4	Viscous

No.	Parameter
1	Block
2	Granular
3	Powder

5.4 【Material Surface Characteristics】

Set the surface fluctuation state of the material.

No.	Parameter
1	Normal
2	Small
3	Medium
4	Large

5.5 【Low DK Value】

Set this parameter when the material has a relatively low DK value.

5.6 【Range Setting】

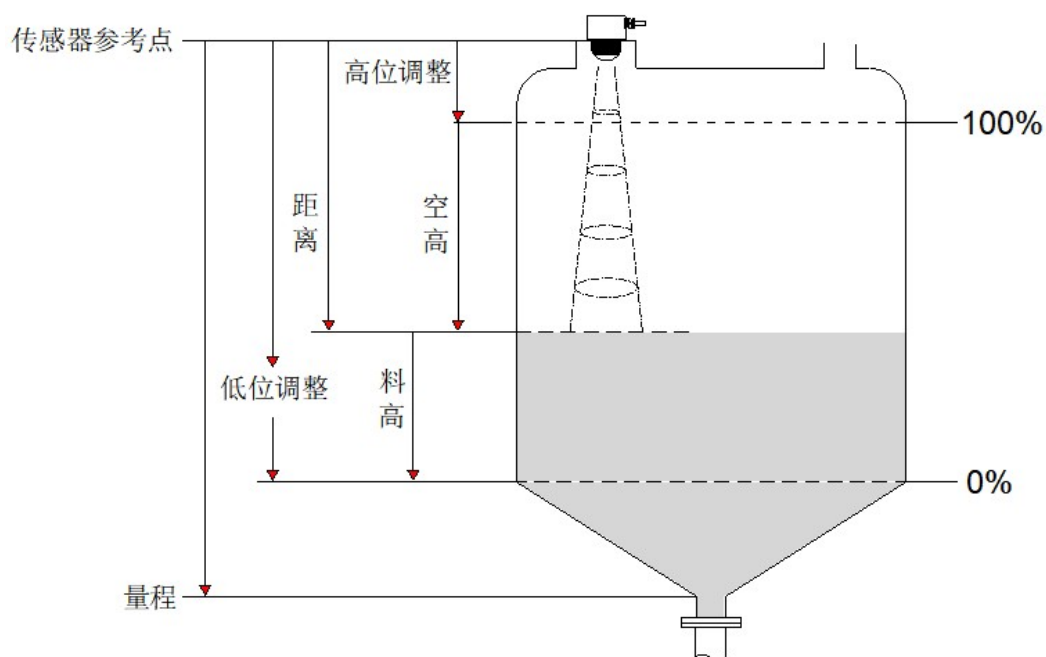
Set the instrument's measurement range according to the figure below. This defines the algorithm's active measurement zone.

5.7 【High/Low Level Setting】

Set according to the figure below:

- High Level: corresponds to full material position
- Low Level: corresponds to empty tank position

The high and low levels also correspond to the 4–20 mA current output.



5.8 【Current Output】

Set the loop current output mode of the instrument.

No.	Parameter
1	4 – 20 mA
2	20 – 4 mA

5.9 【In/Out Material Rate】

Adjusts the instrument's response speed to actual changes in material level.

5.10 【Damping Time】

Applies damping/filtering to smooth the measurement results, preventing sudden changes and stabilizing the output. The larger the value, the smoother the output variation.

5.11 【Distance Offset】

Used to correct the overall deviation between the measured value and the actual value.

5.12 【Fault Mode】

Sets the output current behavior when the instrument malfunctions.

No.	Parameter
1	No Change
2	22 mA
3	20.5 mA
4	3.9 mA

5.13 【Transmitter Gain】

Adjusts the strength of the instrument's RF transmission signal.

No.	Parameter
1	Strongest
2	Normal
3	Reduced
4	Weak

5.14 【Receiver Gain】

Adjusts the strength of the instrument's RF reception signal.

No.	Parameter
1	Strongest
2	Normal
3	Reduced
4	Weak

5.15 【Current Simulation】

Simulates different input current values to check whether the instrument's output loop current is normal.

5.16 【Material Height Simulation】

Simulates different material heights to verify that the instrument's output loop current responds correctly.

5.17 【Echo Threshold】

Sets the threshold for valid echoes, helping to filter out interfering signals.

5.18 【Environmental Noise Threshold】

Sets the threshold for environmental noise.

5.19 【Echo Selection】

When multiple echoes occur on site, select the desired echo.

No.	Parameter
1	Strongest
2	Strong
3	Slightly Strong
4	Normal
5	Reduced

5.20 【New Learning】

Based on the set low and high levels, create a new learning profile to identify false echoes in containers with obstacles.

5.21 【Extended Learning】

Continuing from previous learning, further learn false echoes in containers with obstacles based on the set low and high levels.

5.22 【Automatic Learning】

When the radar-measured distance exceeds the set position, the device automatically learns false echoes in containers containing obstacles.

5.23 【Clear Learning】

Clears all learned false echoes.

5.23 【HART Setting】

When multiple instruments are connected to a host via the HART interface, set the HART address and configure the instrument to HART multi-drop mode at 4 mA or 8 mA.

5.24 【HART Address】

Sets the HART address, range: 0–15. If the address is not 0, HART mode must be set to 4

mA or 8 mA.

5.25 【HART Mode】

Sets the loop current when the instrument operates in HART multi-drop mode.

No.	Parameter
1	Normal
2	4 mA
3	8 mA

5.26 【Measurement Unit】

Sets the unit displayed by the instrument.

No.	Parameter
1	m
2	ft

5.27 【Device Label】

Sets the label displayed on the main interface.

5.28 【Device Information】

Displays the instrument's type, serial number, and manufacturing date.

5.29 【Version Information】

Displays the instrument's version-related information.

5.30 【Restore Factory Settings】

Restores all instrument parameters to the factory default settings.

6 Instrument Maintenance

We provide a full range of services for our customers, including technical consultation, user training, on-site installation and commissioning, product replacement and repair, as well as on-site technical support.

Jiwei products come with a one-year warranty, during which repairs are provided free of charge. Long-term technical support is also available. For inquiries during use, please call our service hotline: +86 755 28407683 or visit www.jiweiauto.com for more information on our services.

7 Storage and Transportation

7.1 Packaging

The instrument you purchased is protected by packaging materials during transportation to the installation site.

It is packaged in a carton, which is environmentally friendly and recyclable. Please have the packaging materials recycled by a professional recycling company.

7.2 Transportation

Transport should follow the instructions on the packaging; failure to do so may result in instrument damage.

Upon receipt, check the integrity of the packaging and for any possible transport damage. If any damage or hidden defects are found, report them promptly.

7.3 Storage

When storing packaged items, observe the following conditions:

1. Avoid outdoor storage.
2. Avoid storing in humid or dusty environments.
3. Avoid contact with corrosive substances.
4. For radar level meters, avoid direct sunlight.
5. Potential static hazards exist; use a damp cloth for cleaning.
6. Avoid mechanical vibration.
7. Storage environment: Relative humidity: 0–95%, Temperature: –20–60°C.